

SECTION 712 FENCING MATERIALS

712.01 CHAIN LINK FENCE.

712.01.1 General. Meet AASHTO M 181 requirements, as modified herein. Use one of the following fence fabrics, as specified in the Contract:

- Type 1 Class C Zinc-Coated Steel,
- Type 2 Aluminum-Coated Steel,
- Type 3 Aluminum Alloy,
- Type 4 Vinyl-Coated Fabric.

Use zinc-coated steel for all Type 1 or Type 2 fabric fence posts, rails, gate frames, expansion sleeves, wire ties, fabric ties, hog rings, tension wire, miscellaneous fittings, and hardware. Use aluminum alloy for these same Type 3 fabric fence parts. Use either zinc-coated steel or aluminum alloy for these Type 4 fabric fence parts.

712.01.2 Fence Fabric. Furnish fence fabric having 2-inch (50 mm) openings and meeting AASHTO M 181 requirements. Use 11-gauge wire for fabric 48-inches (1,220 mm) high and under. Use 9-gauge wire for fabric 60-inches (1,525 mm) high and over. The fabric height is specified in the contract.

712.01.3 Posts, Rails, and Braces. Meet Table 701-1 and the Contract length requirements. Furnish all posts with a watertight cap that fits securely over the outside post top and supports the top rail.

712.01.4 Truss Rods. Furnish $\frac{3}{8}$ -inch (9.5 mm) truss rods as follows:

- steel - galvanized with drop-forged turnbuckles or other approved type of adjustment.
- aluminum - with cast aluminum turnbuckles or other approved type of adjustment.

712.01.5 Fabric Bands and Stretcher Bars. Furnish bands as follows:

- steel - a minimum $\frac{1}{8}$ -inch (3 mm) thick by $\frac{3}{4}$ -inch (19 mm) wide
- aluminum - a minimum $\frac{1}{8}$ -inch (3 mm) thick by $\frac{7}{8}$ -inch (22 mm) wide.

Furnish aluminum or steel stretcher bars as follows:

- a minimum $\frac{1}{4}$ -inch (6 mm) thick by $\frac{3}{4}$ -inch (19 mm) wide
- at least 2-inches (50 mm) shorter than the fabric width used.

712.01.6 Tie Wire. Furnish 9-gauge galvanized steel tie wire meeting ASTM A 116 requirements. Furnish 11-gauge, Class 1 galvanized steel hog ring fasteners meeting ASTM A 116 requirements.

Furnish 9-gauge aluminum tie wire meeting ASTM B 211 Alloy 1100, Temper H14 requirements. Furnish minimum 11-gauge aluminum hog ring fasteners meeting ASTM B 211, Alloy 6061 requirements.

712.01.7 Tension Wire. Furnish 7-gauge galvanized coiled spring steel tension wire. Meet ASTM A 116, Class 1 galvanizing requirements.

Furnish 6-gauge aluminum tension wire meeting ASTM B 211, Alloy 6061, Temper T 94 requirements.

712.01.8 Gates. Furnish gates complete with all necessary hinges, latch, and drop-bar locking device for the type of gate and gate posts specified. Meet AASHTO, AWS specifications, and the contract requirements for all welding.

A. Steel Gates. Construct gate frames from steel sections meeting Table 712-1 requirements. The gate frame corners may be welded or fastened and reinforced with galvanized malleable-iron fittings designed for this use.

Use chain link fabric for gate frames meeting Subsection 712.01.2 and match the fabric used in the fence.

B. Aluminum Gates. Construct gate frames from aluminum sections meeting Table 712-1 requirements. Assemble the gates frames by welding.

Use aluminum alloy cast hinges meeting ASTM B 108 or B 26 requirements or made of malleable iron or steel and hot-dip galvanized or mechanically galvanized meeting ASTM B 695 (Class 50). Make all latches, stops, and keepers of the aluminum alloy specified for hinges or use galvanized malleable iron or pressed steel.

Use chain link fabric for the gate frame meeting Subsection 712.01.2 requirements and matching the fabric used in the fence.

**TABLE 712-1
TABLE OF FENCE SUPPORTS & FRAMING FOR CHAIN LINK FENCE**

USE		STEEL-SHAPE, SIZE, WEIGHT	ALUMINUM-SHAPE, SIZE, WEIGHT
Line Posts	Grade 1	1.90" O.D. Pipe @ 2.70 lb/ft (48 mm O.D. Pipe @ 4 kg/meter) 1.875" x 1.625" x 0.113" H-Section @ 2.70 lb/ft (571 mm x 495 mm x 35 mm @ 4 kg/meter)	2.375" O.D. Pipe @ 1.25 lb/ft (61 mm O.D. Pipe @ 1.85 kg/meter) 2.25" x 1.95" H-Section @ 1.25 lb/ft (58 mm x 50 mm H-Section @ 1.90 kg/meter)
	Grade 2	1.90" O.D. Pipe @ 2.28 lb/ft (48 mm O.D. Pipe @ 3.40 kg/meter)	
End, Corner & Pull Posts	Grade 1	2.375" O.D. Pipe @ 3.65 lb/ft (61 mm O.D. Pipe @ 5.40 kg/meter) 2.0" x 2.0" sq. Tubing @ 3.61 lb/ft (51 mm x 51 mm sq. tubing @ 5.40 kg/meter)	2.875" O.D. Pipe @ 2.0 lb/ft (75 mm O.D. Pipe @ 3 kg/meter) 3.0" x 3.0" sq. Tubing @ 2.0 lb/ft (76 x 76 mm sq. Tubing @ 3 kg/m)
	Grade 2	2.375" O.D. Pipe @ 3.12 lb/ft (61 mm O.D. Pipe @ 4.6 kg/meter)	
<u>Gate Posts</u> Gate Leaf Width 6 ft and less (1.8 m and less)	Grade 1	2.875" O.D. Pipe @ 5.79 lb/ft (73 mm O.D. Pipe @ 8.60 kg/meter) 2.5" x 2.5" sq. Tubing @ 5.7 lb/ft (64 mm x 64 mm Tubing @ 8.50 kg/meter)	2.875" O.D. Pipe @ 2.0 lb/ft (73 mm O.D. Pipe @ 3 kg/meter)
	Grade 2	2.875" O.D. Pipe @ 4.64 lb/ft (73 mm O.D. Pipe @ 6.9 kg/meter)	3.0" x 3.0" sq. Tubing @ 2.0 lb/ft (76 x 76 mm sq. Tubing @ 3 kg/meter)
Over 6 ft thru 13 ft (1.8 thru 4 m)	Grade 1	4.0" O.D. Pipe @ 9.10 lb/ft (105 mm O.D. Pipe @ 13.5 kg/meter) 3.0" x 3.0" sq. Tubing @ 9.10 lb/ft (76 mm x 76 mm Tubing 13.5 kg/meter)	4.0" O.D. Pipe @ 3.0 lb/ft (102 mm O.D. Pipe @ 4.50 kg/meter)
Over 13 ft thru 18 ft (4 thru 5.5 m)	Grade 1	6.625" O.D. Pipe @ 18.97 lb/ft (168 mm O.D. Pipe @ 28.20 kg/meter)	6.625" O.D. Pipe @ 7.0 lb/ft (168 mm O.D. Pipe @ 10.50 kg/meter)
Rails and Braces	Grade 1	1.660" O.D. Pipe @ 2.27 lb/ft (42 mm O.D. Pipe @ 3.40 kg/meter)	1.660" O.D. Pipe @ 0.786 lb/ft (42 mm O.D. Pipe @ 1.2 kg/meter)
	Grade 2	1.660" O.D. Pipe @ 1.84 lb/ft (42 mm O.D. Pipe @ 2.70 kg/meter)	
<u>Gate Frames</u> Leaf Width Less than 8 ft. (2.4 m)	Grade 1	1.660" O.D. Pipe @ 2.27 lb/ft (42 mm O.D. Pipe @ 3.40 kg/meter) 1.5" x 1.5" sq. Tubing @ 1.90 lb/ft (38 mm X 38 mm Tubing @ 2.90 kg/meter)	1.900" O.D. Pipe @ 0.94 lb/ft (48 mm O.D. Pipe @ 1.40 kg/meter) 2.0" x 2.0" sq. Tubing @ 0.94 lb/ft (51 x 51 mm sq. Tubing @ 1.40 kg/meter)
	Grade 2	1.660" O.D. Pipe @ 1.84 lb/ft (42 mm O.D. Pipe @ 2.70 kg/meter)	
Over 8 ft (2.4 m)	Grade 1	1.90" O.D. Pipe @ 2.72 lb/ft (48 mm O.D. Pipe @ 4 kg/meter) 2.0" x 2.0" sq. Tubing @ 2.10 lb/ft (51 mm x 51 mm sq. Tubing @ 3.10 kg/meter)	1.90" O.D. Pipe @ 0.94 lb/ft (48 mm O.D. Pipe @ 1.40 kg/meter) 2.0" x 2.0" sq. Tubing @ 0.94 lb/ft (51 x 51 mm sq. Tubing @ 1.40 kg/meter)
	Grade 2	1.90" O.D. Pipe @ 2.28 lb/ft (48 mm O.D. Pipe @ 3.40 kg/meter)	

712.02 INTERSTATE FENCE AND FARM FENCE.

712.02.1 Woven Wire. Furnish woven wire meeting ASTM A 116 requirements and the following:

- A. Interstate Wire Fence.** Use woven wire that is No. 12½ Grade 60, Design Number 832-6-12½, shown in Table 1 of ASTM A 116. Zinc coating must be Class 1 shown in Table 3 (ASTM A 116).
- B. Farm Fence.** Use woven wire that is No. 12½ Grade 60 in ASTM A 116, Table 1. Provide a stay wire spacing of 6-inches (155 mm). Match the fence height and mesh dimensions of the fence being replaced if not specified. Zinc coating must be Class 1 as shown in Table 3 (ASTM A 116).

712.02.2 Barbed Wire. Use 2-point 12½ or 13½ gauge barb wire meeting ASTM A 121 requirements. Space barbs a nominal 4-inches (105 mm) or a nominal 5-inches (130 mm). Zinc coating must be Class 1 for 12½ and 13½ gauge wire. Provide the Project Manager Certification that the wire meets ASTM A 121 requirements.

712.02.3 Brace Wire. Use 9 or 12½ gauge soft, smooth wire.

712.02.4 Staples and Nails. Use minimum 9-gauge U-shaped, 1¾-inch (45 mm) long staples unless otherwise specified.

712.02.5 Tie Wires. Use minimum 12½ gauge galvanized tie wire. Commercial galvanized fasteners supplied with the wire may be used if approved by the Project Manager.

712.02.6 Metal Fence Stays. Use commercially made and fabricated metal fence stays from 9½ gauge wire twisted to form a two wire unit.

712.02.7 Metal Posts and Assemblies. Provide metal fence posts and assemblies meeting ASTM A 702 requirements, modified as follows: Tables 3, 4, and 6.1 through 6.2.2 of ASTM A 702 apply to finished posts and assemblies after fabrication, punching, drilling, and finish coating.

Galvanize or paint posts, braces, and anchor plates. Meet AASHTO M 111 galvanizing requirements. Furnish nuts, bolts, fittings, and other hardware meeting ASTM A 153 or B 695 (Class 50) galvanizing requirements. Paint following the paint manufacturer's recommendations.

Furnish fence posts and braces of the lengths in Table 712-2.

**TABLE 712-2
POST LENGTHS**

Fence	Post Type	Corner, End Gate, Pull & Panel Posts	Line Posts	Brace and Brace Rail
Interstate	Metal	7'-8" (2.3 m)	6'-6" (2.0 m)	7'-8" (2.3 m)
Interstate	Wood	8'-0" (2.4 m)	7'-0" (2.1 m)	8'-0" (2.4 m)
Farm	Metal	7'-0" (2.1 m)	6'-6" (2.0 m)	7'-8" (2.3 m)
Farm	Wood	8'-0" (2.4 m)	7'-0" (2.1 m)	8'-0" (2.4 m)

Use 2½" X 2½" X ¼" (64 X 64 X 6 mm) or heavier metal fence posts for Interstate and Farm fence for corner, end, gate and pull posts. Use 2" X 2" X ¼" (51 X 51 X 6 mm) or heavier metal pipe brace posts. Line posts must have a nominal weight of 1.33 lbs. per foot (2 kg per meter) (exclusive of anchor plates).

The metal must be a good commercial-quality steel having a maximum 0.82 percent carbon content.

Use Tee, Channel, U, or Y bar section line posts with corrugations, knobs, notches, holes, or studs placed to engage the fence line wires.

Weld a steel anchor plate to each line post so that the anchor top is 2 to 3-inches (50 to 75 mm) below groundline when the post is set to the specified depth.

712.02.8 Wood Fence Posts and Brace Rails.

- A. General.** Make posts and brace rails from well-seasoned, sound, and straight-grained Western Larch, Lodgepole Pine, Ponderosa Pine, or Douglas Fir. Remove all bark from the posts.

Taper round posts to be driven for 8 to 12-inches (205 to 305 mm) up from the bottom to a 1-inch (25 mm) point. Taper the post tops to a round top with a minimum 3-inch (75 mm) diameter for line posts and 4-inches (105 mm) for corner, brace, pull, end, and gate posts. These taper lengths are included in the specified post lengths. Perform all tapering before treatment.

Brace rails for farm fence do not require treatment. Use minimum 4-inch (105 mm) diameter brace rails. All posts with a bow exceeding 2-inches (50 mm) in 7 feet (2.1 m) will be rejected.

- B. Posts for Farm Fence.** Furnish posts meeting the dimensional requirements in Subsection 712.02.8 (C).

Treat the posts with a minimum 5 percent by weight pentachlorophenol solution or Chromated Copper Arsenate (CCA), Type B or C, or Ammoniacal Copper Arsenate (ACA) meeting AWP Standards. Assure the treatment penetrates the wood at least ½-inch (13 mm) or full sap, with a minimum retention of 0.4 lbs. per cubic foot (6.50 kg per cubic meter).

Extend the treatment for at least 36-inches (915 mm) for line posts and 48-inches (1,220 mm) for all other posts. Post treatment must be at a Department approved plant.

C. Posts For Interstate Fence. Furnish line posts and brace rails from a minimum 4-inch (105 mm) diameter, naturally round, or a minimum 4 X 4-inch (105 X 105 mm) square sawn. Furnish corner, end, gate, pull, and brace posts from a minimum 5-inch (130 mm) diameter naturally round post or a 5 X 5-inch (130 X 130 mm) square sawn post.

Treat all wood fence material meeting Subsection 706.04.1 requirements.

712.02.9 Metal Gates. Furnish each gate complete with hinges, latch, and all other hardware used with the type of gate and gate post specified.

712.02.10 Gates For Interstate Fence. Use plain-top single-drive metal gates of tubular steel frame with wire fabric filler. Fit the gate to the opening between the gate posts of the approximate widths shown in the Detailed Drawings. Provide a centered steel upright brace for gates for openings of less than 14 feet (4.3 m), two upright steel braces at third points for gates for openings of 14 feet (4.3 m) or greater.

Fill the metal gates with galvanized wire fabric securely fastened to the top, bottom, ends of the gate frame.

Use fabric meeting Subsection 712.02.1, class 1 or better.

The approximate weight of the gate frames (less fabric) must be as follows:

Width of Opening	Approximate Weight *
8'(2.4 m)	48 pounds (22 kg)
10' (3 m)	55 pounds (25 kg)
12'(3.7 m)	62 pounds (28 kg)
14'(4.3 m)	72 pounds (33 kg)
16'(4.9 m)	80 pounds (36 kg)

*Heavier gates will be permitted if they meet all other requirements

712.02.11 Gates For Farm Fence. Furnish farm fence gates meeting the Detailed Drawings and Contract requirements.

712.02.12 Deadman or Anchor.

Furnish deadman and anchor(s) meeting the Detailed Drawing requirements.

712.02.13 Miscellaneous. Bolts, nuts, fittings, hinges, and all other metal parts for constructing fences and gates must be galvanized meeting the specified ASTM specification.